

When specified in §179.201-1, the tank must have at least one manway or one expansion dome with manway, and such other external projections as are prescribed herein. When the tank is divided into compartments, each compartment must be treated as a separate tank.

[Amdt. 179-10, 36 FR 21348, Nov. 6, 1971]

#### § 179.200-4 Insulation.

(a) If insulation is applied, the tank shell and expansion dome when used must be insulated with an approved material. The entire insulation must be covered with a metal jacket of a thickness not less than 11 gauge (0.1196 inch) nominal (Manufacturer's Standard Gauge) and flashed around all openings so as to be weather tight. The exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket must be given a protection coating.

(b) If insulation is a specification requirement, it shall be of sufficient thickness so that the thermal conductance at 60 °F is not more than 0.225 Btu per hour, per square foot, per degree F temperature differential, unless otherwise provided in §179.201-1. If exterior heaters are attached to tank, the thickness of the insulation over each heater element may be reduced to one-half that required for the shell.

[29 FR 18995, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967, and amended by Amdt. 179-10, 36 FR 21349, Nov. 6, 1971; Amdt. 179-50, 60 FR 49078, Sept. 21, 1995]

#### § 179.200-6 Thickness of plates.

(a) The wall thickness after forming of the tank shell, dome shell, and of 2:1 ellipsoidal heads must be not less than specified in §179.201-1, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

Where:

$d$  = Inside diameter in inches;

$E$  = 0.9 Welded joint efficiency; except  $E=1.0$  for seamless heads;

$P$  = Minimum required bursting pressure in psig;

$S$  = Minimum tensile strength of plate material in p.s.i. as prescribed in §179.200-7;

$t$  = Minimum thickness of plate in inches after forming.

(b) The wall thickness after forming of 3:1 ellipsoidal heads must be not less than specified in §179.201-1, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE} \times 1.83$$

Where:

$d$  = Inside diameter in inches;

$E$  = 0.9 Welded joint efficiency; except  $E=1.0$  for seamless heads;

$P$  = Minimum required bursting pressure in psig;

$S$  = Minimum tensile strength of plate material in p.s.i. as prescribed in §179.200-7;

$t$  = Minimum thickness of plate in inches after forming.

(c) The wall thickness after forming of a flanged and dished head must be not less than specified in §179.201-1, nor that calculated by the following formula:

$$t = \frac{5PL}{6SE}$$

Where:

$E$  = 0.9 Welded joint efficiency; except  $E=1.0$  for seamless heads;

$L$  = Main inside radius to which head is dished, measured on concave side in inches;

$P$  = Minimum required bursting pressure in psig;

$S$  = Minimum tensile strength of plate material in p.s.i. as prescribed in §179.200-7;

$t$  = Minimum thickness of plate in inches after forming.

(d) If plates are clad with material having tensile strength properties at least equal to the base plate, the cladding may be considered a part of the base plate when determining thickness. If cladding material does not have tensile strength at least equal to the base plate, the base plate alone must meet the thickness requirements.

(e) For a tank constructed of longitudinal sections, the minimum width of bottom sheet of the tank must be 60 inches measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal welded joint, including welds, above the bolster.

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(f) For a tank built of one piece cylindrical sections, the thickness specified for bottom sheet must apply to the entire cylindrical section.

(g) See §179.200-9 for thickness requirements for a compartmented tank.

[Amdt. 179-10, 36 FR 21349, Nov. 6, 1971, as amended at 66 FR 45390, Aug. 28, 2001]

### § 179.200-7 Materials.

(a) Plate material used to fabricate the tank and, when used, expansion dome or manway nozzle material, must meet one of the following specifications with the indicated minimum tensile strength and elongation in the welded condition.

(b) *Carbon steel plate:* The maximum allowable carbon content must be 0.31 percent when the individual specification allows carbon content greater than this amount. The plates may be clad with other approved materials:

Specifications	Minimum tensile strength (p.s.i.) welded condition <sup>1</sup>	Minimum elongation in 2 inches (percent) weld metal (longitudinal)
AAR TC 128, Gr. B .....	81,000	19
ASTM A 516 <sup>2</sup> .....	70,000	20

<sup>1</sup> Minimum stresses to be used in calculations.

<sup>2</sup> This specification is incorporated by reference (IBR, see § 171.7 of this subchapter).

(c) *Aluminum alloy plate:* Aluminum alloy plate must be suitable for welding and comply with one of the following specifications (IBR, see §171.7 of this subchapter):

Specifications	Minimum tensile strength (p.s.i.) welded condition <sup>3,4</sup>	Minimum elongation in 2 inches (percent) 0 temper weld metal (longitudinal)
ASTM B 209, Alloy 5052 <sup>1</sup> .....	25,000	18
ASTM B 209, Alloy 5083 <sup>2</sup> .....	38,000	16
ASTM B 209, Alloy 5086 <sup>1</sup> .....	35,000	14
ASTM B 209, Alloy 5154 <sup>1</sup> .....	30,000	18
ASTM B 209, Alloy 5254 <sup>1</sup> .....	30,000	18
ASTM B 209, Alloy 5454 <sup>1</sup> .....	31,000	18
ASTM B 209, Alloy 5652 <sup>1</sup> .....	25,000	18

<sup>1</sup> For fabrication, the parent plate material may be 0, H112, or H32 temper, but design calculations must be based on minimum tensile strength shown.

<sup>2</sup> 0 temper only.

<sup>3</sup> Weld filler metal 5556 must not be used.

<sup>4</sup> Maximum stresses to be used in calculations.

(d) *High alloy steel plate:* High alloy steel plate must comply with one of the following specifications:

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Specifications	Minimum tensile strength (p.s.i.) welded condition <sup>1</sup>	Minimum elongation in 2 inches (percent) weld metal (longitudinal)
ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter), Type 304 .....	75,000	30
ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter), Type 304L .....	70,000	30
ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter), Type 316 .....	75,000	30
ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter), Type 316L .....	70,000	30

<sup>1</sup> Maximum stresses to be used in calculations.

<sup>2</sup> High alloy steel materials used to fabricate tank and expansion dome, when used, must be tested in accordance with Practice A of ASTM Specification A 262 titled, "Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels" (IBR; see § 171.7 of this subchapter). If the specimen does not pass Practice A, Practice B or C must be used and the corrosion rates may not exceed the following:

Test procedure	Material	Corrosion rate i.p.m.
Practice B .....	Types 304, 304L, 316, and 316L.	0.0040
Practice C .....	Type 304L .....	.0020

Type 304L and Type 316L test specimens must be given a sensitizing treatment prior to testing. (A typical sensitizing treatment is 1 hour at 1250 F.)

(e) *Nickel plate:* Nickel plate must comply with the following specification (IBR, see §171.7 of this subchapter):

Specifications	Minimum tensile strength (psi) welded condition <sup>1</sup>	Minimum elongation in 2 inches (percent) weld metal (longitudinal)
ASTM B 162 <sup>2</sup> .....	40,000	20

(f) *Manganese-molybdenum steel plate:* Manganese-molybdenum steel plate must be suitable for fusion welding and comply with the following specification (IBR, see §171.7 of this subchapter):

Specifications	Minimum tensile strength (p.s.i.) welded condition <sup>1</sup>	Minimum elongation in 2 inches (percent) weld metal (longitudinal)
ASTM A 302, Gr. B .....	80,000	20

<sup>1</sup> Maximum stresses to be used in calculations.